

November 15, 1985

CD-85-16

Dear Manufacturer:

SUBJECT: Guidance on NOx Averaging for Light-Duty Trucks

The enclosed document provides guidance concerning the averaging program for NOx emissions from 1988 and later model year light-duty trucks. This guidance explains the regulation requirements as well as answers specific questions received from the industry. Since application of the program will likely be unique for each manufacturer, we urge the individual manufacturers to present their plans for use of the program to EPA for early review. This will prevent misconceptions later in the production year.

Sincerely,

Robert E. Maxwell, Director
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Office of Mobile Sources

Enclosure

GUIDANCE ON NO_x AVERAGING FOR LIGHT-DUTY TRUCKS

I. Purpose:

The purpose of this document is to provide guidance concerning emissions averaging as it relates to the NO_x regulations for 1988 and later model year light-duty trucks (50 FR 10606, March 15, 1985). This is done in the following discussion by briefly presenting some background information and then answering directly several questions raised by manufacturers.

II. Background:

EPA has adopted procedures that give manufacturers the option of averaging NO_x emissions from light-duty trucks beginning with the 1988 model year. The averaging program is intended to allow manufacturers greater flexibility in meeting the applicable 1988 NO_x emissions standards. The implementation scheme is very similar to that promulgated for particulate emissions from light-duty diesel vehicles and trucks (48 FR 33456, July 21, 1983).

A participating manufacturer would be required to determine emission limits for each light-duty truck engine family to be produced in a given model year. Each engine family may have only one family emission limit (FEL). The NO_x FEL for light-duty trucks may be greater than the applicable Federal emission standard for that weight class, but must be lower than or equal to a ceiling of 2.3 g/mi. Each manufacturer should exercise prudence in the determination of FEL's, for as the following paragraphs indicate, these numbers are crucial to determining compliance with the averaging regulations. Also, each FEL will have the same relationship to an engine family as emission standards currently have to all engine families taken as a whole, and thus will serve as the effective standard by which EPA will determine compliance of all engines within that family. The criteria used to distinguish engine families will remain the same as those already in effect.

Manufacturers electing to participate in the averaging program must define a manufacturer composite NOx standard (MCNS). In the case where a manufacturer elects to average vehicles from both weight classes, this number is found by the following formula which is reproduced here from §86.088-2.

$$\text{MCNS} = \frac{(\text{PLLD}) (\text{STDLLD}) + (\text{PHLD}) (\text{STDHLD})}{(\text{PLLD}) + (\text{PHLD})}$$

where: MCNS = manufacturer's composite NOx standard

PLLD represents the manufacturer's final production volume of vehicles in the light light-duty class (less than, or equal to 3750 lbs loaded vehicle weight) and participating in the averaging program.

PHLD represents the manufacturer's final production volume of vehicles in the heavy light-duty class (greater than 3750 lbs loaded vehicle weight) and participating in the averaging program.

STDLLD represents the NOx emission standard applicable to the light light-duty vehicle class (1.2 g/mi).

STDHLD represents the NOx emission standard applicable to the heavy light-duty vehicle class (1.7 g/mi).

If the manufacturer does not include vehicles from both weight classes, the MCNS equals the applicable Federal standard and the above calculation is not necessary.

The MCNS must be determined separately for vehicles produced for sale in high and low altitude areas. Thus, those manufacturers who build vehicles for sale in both geographical regions, and wish to average in both regions, will have two separate and distinct MCNSs. Where a single engine family crosses the geographical boundaries, the vehicles produced for sale in high altitude areas will contribute to the high altitude MCNS and the vehicles produced for sale in low altitude areas will contribute to the low altitude MCNS. Under no circumstances can a single MCNS be found which includes

vehicles built for high altitude areas as well as vehicles built for low altitude areas.

Compliance with the MCNS is demonstrated at the end of the production year by calculating a production-weighted average emission level (PWEL). This calculation is carried out using the following formula:

$$\text{PWEL} = \frac{(\text{PFA}) * (\text{FELA}) + (\text{PFB}) * (\text{FELB}) + \dots}{(\text{PFA}) + (\text{PFB}) + \dots}$$

where: PWEL = manufacturer's production-weighted average emission limit; the PWEL must be less than or equal to the MCNS for the manufacturer to be in compliance with the NOx averaging program requirements.

PFA = manufacturer's final production volume for engine family A

FELA = family emission limit assigned to engine family A

PFB = manufacturer's final production volume for engine family B

FELB = family emission limit assigned to engine family B

Again, for those manufacturers that produce vehicles for sale in both geographical areas and who wish to average, this number is computed and compliance demonstrated on both a high altitude and low altitude basis. Only those engine families that the manufacturer wishes to be a part of the averaging program and are thus a part of the MCNS calculation, are to be included in the calculation of a manufacturer's production-weighted average emission level.

The above equations demonstrate the close relationship between the production volume of an engine family and the emission limit assigned to that particular family. Also important is the proportion of total sales represented by each engine family. During production, a manufacturer will have full responsibility for controlling these parameters by taking

whatever action may be necessary to ensure that the light-duty truck fleet meets the applicable standard at the end of the model year. To be in compliance the manufacturer's PWEL must be less than or equal to its MCNS. This may require the manufacturer to recertify some families to new family emission limits. EPA will permit the creation of new family emission limits for NOx during the model year without making any changes to the engine. It is anticipated that manufacturers will generally revise downward to ensure year-end compliance with the applicable standard. Such revisions must be supported by the certification data/running change information. Additionally, revisions to a certified FEL must not be lower than the emission levels (with deterioration factor applied) for test vehicles used in the fuel economy program. When a family limit is changed, EPA will issue a new certificate

applicable to subsequent vehicle production. Manufacturers must provide a statement (as per §86.088-23(g)(2)) giving the number of vehicles produced under each FEL no later than 90 days following the end of the model year production. Revised FEL's will not be retroactively applied to all vehicles in the engine family.

The Administrator will grant a certificate of conformity to each family that demonstrates compliance with its family emission limit. It will be a condition of the certificate that the manufacturer's production-weighted average emission level meet the manufacturer's composite NOx standard at the end of the model year. The certificate would be rendered void ab initio at the conclusion of the model year for those engine families causing the MCNS to be exceeded. The preamble to the final rule (50 FR 10606, March 15, 1985) states further that:

Any engine whose certificate is rendered void ab initio would be in violation of section 203 of the Act. A manufacturer would be subject, under section 205, to a \$10,000 fine for each engine found to be in such violation. However,...manufacturers should realize that EPA's objective in granting conditioned certificates is not to impose (arbitrary) penalties...but simply to give itself the ability to seek some remedy through

a...settlement in the event of noncompliance. The Agency of course would have some discretion in choosing which remedies and/or penalties to pursue where violations occurred. Since EPA's primary goal would be to eliminate the nonconformance, it would likely seek recall of certain affected vehicles, where appropriate, for the purpose of adjusting overall emissions to bring the manufacturer's average into compliance....EPA will certainly consider which engines are most efficiently recalled to achieve redress.

Finally, manufacturers are reminded that the averaging program is completely voluntary. A manufacturer who does not believe that it can adequately implement the program's requirements is under no obligation to participate.

III. Discussion:

The new oxides of nitrogen emissions standards for 1988 and later model year trucks are 1.2 and 1.7 g/mi depending on

vehicle test weight. Several questions have been posed by manufacturers regarding these new regulations and the averaging program. Several of these questions along with answers are listed on the following pages.

Question 1: In the past, for California certification, a single engine family could include both split-class standards. How will EPA handle this situation under the Federal averaging programs? How would engine family limits be set in this case?

Answer: EPA requires that vehicles certified to the 1.2 g/mi standard be of a different engine family than vehicles certified to the 1.7 g/mi standard. This means that manufacturers are required to have separate applications and data fleets for each standard even though the mechanical designs of the two engine families may be similar enough to otherwise be combined in the same engine family. (Note that carry-across from one engine family to another may be

appropriate. This could lessen the need to perform separate durability and emission data evaluation for two such engine families.) Only one FEL may be applied per engine family. Therefore, those vehicles built to the 1.2 standard constitute an engine family and must have a family emission limit. The vehicles built to the 1.7 standard also constitute a family and must have a FEL. As explained in Question #2 the averaging program provides a mechanism to combine these two families in certain situations.

Question 2: Can two separate engine families that are mechanically similar and differentiated only by the standard to which they are certified be combined by assigning them FEL's that are identical?

Answer: Two such engine families may be combined by assigning them identical FEL's. The engine families to be combined must fulfill the criteria for being included in the same engine family as per §86.085-24. The manufacturer will be responsible for tracking sales of vehicles which were previously in the 1.2 g/mi and 1.7 g/mi families. This is necessary so that a MCNS may be calculated at the end of the production year.

Question 3: Can high altitude vehicles be excluded from the averaging program?

Answer: Several manufacturers offer the same engine family for sale in both high and low altitude geographical areas. If a manufacturer wishes this particular engine family to be a part of the averaging program, it must normally average on both

a high and low altitude basis. The FEL applied to the engine family would then be used in both the high and low altitude calculations. To avoid this situation, a manufacturer may want to exclude high altitude vehicles from the averaging program. This is, of course, easily done when the high altitude vehicles the manufacturer wishes to exclude are in separate and distinct engine families from those engine families it wishes to include in the averaging program. The regulations clearly allow a manufacturer to select which engine families it wishes to include in the averaging program and which families it wishes to exclude from the program. However, the regulations do not

include any explicit provisions which would allow a manufacturer to include an engine family's low altitude sales in an averaging program while excluding the high altitude sales from the same family. In effect, this would allow a manufacturer to split an engine family into more than one group for the purposes of determining emission compliance. In the specific case addressed here, the high altitude sales would be certified against the Federal standard while the low altitude sales would, presumably, be certified against a FEL either greater or less than the Federal standard. In considering the more general case of splitting an engine family into more than one compliance group via multiple standards (that is, more than one FEL within the engine family), EPA determined that such subdivision of engine families and proliferation of compliance groups could, if widely practiced, make in-use compliance enforcement more difficult. This in turn could lead to a lesser degree of in-use control. Thus, in establishing the final rules for the NOx averaging program, EPA decided to not include any provisions allowing such subdivision.

However, upon reconsidering the explicit issue of excluding high altitude sales, EPA believes that in-use compliance can be adequately protected under two specific circumstances and will allow these at the option of the manufacturer. First, in the case where the manufacturer assigns an FEL lower than the applicable NOx standard, the manufacturer may exclude the high altitude sales and separately certify them to the applicable Federal standards. Since NOx performance generally improves or, at worst, stays the same when operating at high altitude compared to low altitude, EPA would not expect any unique high altitude NOx compliance problems which would not be observable at low altitude. Thus high altitude NOx performance at least as good as anticipated by the Federal standard would be expected. In the second case, a manufacturer with an assigned FEL greater than the applicable Federal standard could split the engine family and certify the high altitude sales for compliance with the Federal standard. In this case, since the Federal standard is lower than the FEL, the high altitude vehicles within that engine family would be

certified for compliance with a standard lower than that required by the averaging program. Again EPA believes this will result in adequate protection of in-use NOx emission

performance.

The mechanism for excluding high altitude sales from the averaging program according to these two specific circumstances will be to treat the high altitude sales as a unique engine family. The manufacturer must make its intention to follow this option known to EPA in writing in advance of submitting any data or request for certification for the engine family involved. As a consequence of selecting this option, the manufacturer will have to also follow all of the protocols of separate engine family certification including a unique application for the high altitude sales and separate deterioration factors and emission data which is normally required in the certification of a high altitude only engine family.

Question 4: Is prior approval by EPA necessary before a manufacturer undertakes NOx averaging for some or all of its engine families?

Answer: Prior approval by EPA is not necessary. However, it would be prudent for manufacturers to submit an averaging plan to EPA early in the process to prevent misconceptions later in the production year. Also, the manufacturer is reminded that estimated production figures and FEL's must be submitted on the application for certification. In addition, manufacturers are required to submit an engine information sheet before durability testing begins. This sheet requires the manufacturer to indicate the applicable standard. If the engine in question is to be a part of an averaging program and the FEL has not yet been determined, the manufacturer is requested to fill in the form as if the averaging program will not be used. The values entered for the emission standard can be altered to correspond to the FEL at a later date, but prior to any emission data vehicle confirmatory testing by EPA.

Question 5: Has EPA considered an intramanufacturer credit program, similar to the fuel economy CAFE program which allows carry forward and carry back of credits?

Answer: The present regulations do not allow an intramanufacturer credit program. EPA is in the process of exploring the feasibility of this concept.

Question 6: Where no definable defect is at issue what other alternative to recalling a manufacturer's entire production does EPA consider to be an effective and legal enforcement action?

Answer: If, at the end of a production year, a manufacturer who has chosen to average is found to be in noncompliance, the manufacturer will be subject to penalties under section 205 of the Act. This allows EPA to impose a fine of up to \$10,000 for each engine determined to cause the violation. The manufacturers are reminded, however, that EPA's primary objective will be to eliminate the nonconformance. Thus, at least as part of the necessary remedy, EPA may require recall of affected vehicles for the purposes of adjusting overall emissions to bring the manufacturer's average into compliance. EPA will certainly consider which engines are most efficiently recalled.

Question 7: Manufacturers are required to maintain separate averages for 49 state low altitude, 49 state high altitude and California sales. May a manufacturer split one (or more) of these groups into several small sub-groups and apply the averaging program independently to each of these sub-groups?

Answer: This will not be allowed by EPA. While a manufacturer may exclude any families it wishes from the averaging program and certify such individual families to the applicable Federal standard, a manufacturer must include all families it wishes to average in a single average. EPA will not permit manufacturers to apply averaging to numerous small sub-groups within a particular geographical region.